Second Quarterly Report

to

National Aeronautics and Space Administration

Interactive Initialization of Heat Flux Parameters

for Numerical Models Using

Satellite Temperature Measurements

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I. Introduction

The dual focus of this grant, which has been to (i) develop a completely interactive approach to image processing and modeling and (ii) to analyze some meso (rather than urban) scale image pairs from HCMM over an area where a large rainfall gradient was present, has been joined into one approach now that the interactive system has been completed and the surface parameters can be obtained on the department's minicomputer image processor.

II. Analyses

It has been our approach to determine whether patterns of moisture availability and thermal inertia, as well as the surface heat fluxes, respond to significant spatial variations in the rainfall pattern. Since these parameters are so closely tied to the land use, specifically the extent and type of vegetation, it is presently not clear to what extent the antecedent rainfall needs to be considered in determining the values of the parameters for numerical models. We regard this investigation as a pilot study for answering this question.

To examine the spatial variation of moisture availability on the mesoscale, we have chosen two pairs of scenes for analysis, a day/night HCMM image pair for 21-22 August, 1978 over Indiana and one for 27-28 July, 1978 over Kansas. In both these cases, there was a large spatial variation of antecedent rainfall over part of the image area. The August case has been completed using the IBM-370 computer and is currently being redone on the DEC minicomputer to see if identical patterns are obtained. Although plans are being made to improve certain aspects of the boundary

layer model, first on the large computer, an efficient version of the model is incorporated into the image process analysis scheme on the minicomputer.

Results of the Indiana analyses will be presented in the next quarterly report. A temperature analysis for this case, at approximately 1330 LST 22 August, 1978 is presented in Fig. 1. Distinctly warmer temperatures (32-34°C) are visible over the southwestern part of the region, approximately in the area where the rainfall amounts had been low. Accordingly, low values of M (the moisture availability) were derived over that region. However, this case has proved to be somewhat unsuitable for analyses, partly because of transitory cloud (scalloped border) over the central part of the area, and partly because of the 36 h (rather than 12 h) time interval between day and night orbits. Consequently, moisture availability was not very well behaved at high and low values (excluding the cloud area). The Kansas case looks to be more promising.

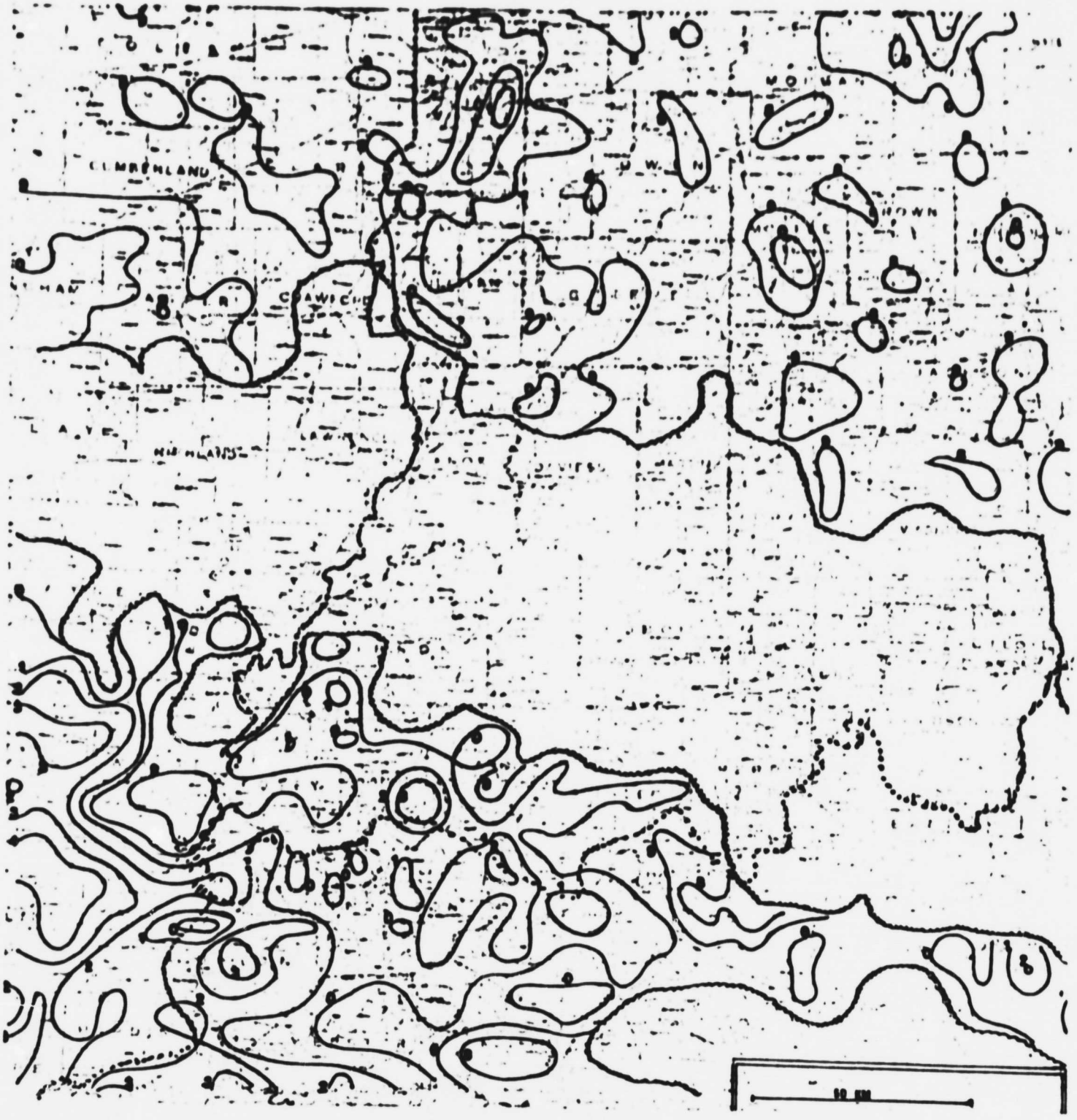

Fig. 1. HCMM infrared temperature analysis, approximately 1330 LST 22 August, 1978. Contour labels refer to degrees centigrade above 30°C (digits 0-4) or above 20°C (digits 8-9).